Dear EDITOR:

Hi! I am a physics graduate student at UC Berkeley. For the past couple of years I have been playing with an idea for a physics educational tool at the high school and freshman university levels – an idea that is fondly referred to as the Phuzzle. Bruce Birkett suggested that I contact you to see if you might be interested in its publication.

## Motivating ideas

1. Summary pages of textbooks are often the most useful (and most used!) pages therein. But a simple summary page of an entire subfield of physics – even of classical mechanics – is surprisingly difficult to find.
2. I have found that a useful distinction can be made between the concepts we define on the one hand and statements about Nature on the other. In addition to clarifying basic concepts, this approach paves the way for a more sophisticated treatment of the assumptions and approximations made when applying these concepts to physical situations, which are rarely ideal.
3. "So what is this stuff good for?" is a frequently asked question, and one that is rarely adequately answered in lecture or the classroom textbook. Most students who ask really do want to know, and there certainly is no shortage of answers!
4. A surprising number of the country's best physics graduate students fumble the types of open-ended questions that are typically asked in the qualifying examinations. Yet few of these problems require physics beyond basic mechanics and electrodynamics, and most students really enjoy working this type of problem.

## The Phuzzle

I envision a classroom-wall-sized poster that tackles the problems described above. The poster is more like a jigsaw puzzle than a traditional poster, though – it is composed of roughly a dozen large jigsaw puzzle pieces. Each jigsaw puzzle piece is devoted to a subfield of physics: one piece for Mechanics, one piece for Electricity and Magnetism, one piece for Thermodynamics, and so on. These pieces, which we typically study individually, fit together into our current understanding of Nature. The mating of physics and puzzle produces a Phuzzle.

Each Phuzzle piece contains a summary of the basic concepts of the subfield it represents (motivating idea #1); this summary occupies roughly half of the piece. The summary is broken into two boxes: a **Definitions** box and an **Observations** box (motivating idea #2); a distinction that is, to my knowledge, original. In the Definitions box we define the most basic concepts of the subfield, and in the Observations box we identify those profound empirical observations that are the subfield's backbone.

The remaining (roughly half) of each piece will be a tapestry of a couple hundred small pictures, each representing a real-world application of the summarized material (motivating idea #3). These small pictures will be woven together, making the poster visually interesting, colorful, and intricate. Viewed from a distance, the summary will stand out against a colorful background. Viewed up close, one can begin to investigate and puzzle over each picture and the application it depicts.

But a picture alone is generally insufficient to cause the viewer to think carefully about the application – we need to also provide a well-chosen question or two (motivating idea #4). Each picture has hidden within it a number that references a page on an accompanying book. This page contains one or more open-ended questions that can be tackled with the concepts in that subfield. The questions are meant to be interesting, engaging, and to provoke some real thought. There will be one book for each piece.

## Drafts

The drafts I have enclosed will hopefully help convey my intent. You should find:

- The Phuzzle Idea (this document)
- Jigsaw Phuzzle (showing the pieces as they fit together)
- Phuzzle pieces
  - Mechanics
  - Electricity and Magnetism
  - Fluids
  - Thermodynamics
- Phuzzle books
  - Mechanics
  - Fluids

Three quick comments: These pieces have roughly twenty application pictures, rather than the two hundred or so I envision – one of the things that I hope you will be able to provide is access to good graphics. I have geared the summaries in these pieces to the university level (or maybe even a bit higher), but the summaries are structured so that this level is easily modified. The draft pieces are rectangular, but they should eventually assume the shape of jigsaw puzzle pieces.

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I see this as an idea that might find a home on high school and university classroom walls across the country, and wonder if PUBLISHER might be interested. The Phuzzle is modular by nature, and there are several variations on the ideas that I have outlined here that could be pursued without changing the spirit of the project. If you are interested, please let me know.

Regards,

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